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A New Device of a Leak Detector

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The variable gas leakage method described in the preceding report was adopted. The pumping speeds were calculated under the range of 400 to 1600 watts heater inputs and various vacuum pressures. The results were that the maximum speed for hydrogen was 180 litre/sec at 1200 watts and that for deuterium 120 litre/sec at 800 watts both under the pressure of about 3×10^{-4} mmHg. Referring to other papers, we deduced that the normal rating was at about 600 watts, and here the pumping speed ratio for hydrogen to deuterium had far smaller value than the theoretical value of $\sqrt{2}$, but this experimental ratio approached to $\sqrt{2}$ in the case of higher heater input.

9. A New Device of a Leak Detector

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The glow discharge of the Philips type vacuum gauge shows the characteristic spectrum of the gas contained. Therefore, the spectroscopic difference takes place according as whether a small quantity of air leaks into the vacuum system or not. Applying a selenium photo-element attached closely to this gauge, we could detect this spectroscopic difference by its photo electromotive force more sensitively and quantitatively than the observation by our naked eyes.

When some organic fluids or gases are attached to the leaking position, they diffuse into the vacuum system and a galvanometer connected to a photo-element shows a conspicuous deflexion after a short time.

Under 1.7 c.c./hr leakage of air, for example, alcohol deflected the galvanometer 20 or 40 divisions after a time lag of 15 seconds and hydrogen 10 divisions after 2 or 5 seconds, whereas the discharge current of the Philips gauge was constant in each case. But acetone gave remarkable effect at once both to the gauge and galvanometer; the deflexion reached 60 or more divisions.

In our present condition, the minimum leakage quantity being detectable will be about 0.2 c.c./hr in air. However, the stabilization of the circuit and the increase of the photo-element will lower this limit, and the usage for a practical leak detector will be expected.